SEH-22 AND SEH-24 10BASE-T STACKABLE HUB

USER'S GUIDE

CABLETRON
SYSTEMS
The Complete Networking Solution™

CABLETRON SYSTEMS, P. O. Box 5005, Rochester, NH 03866-5005

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CHAPTER 1

INTRODUCTION

Welcome to the Cabletron Systems **SEH-22 and SEH-24 10BASE-T Stackable Hubs User's Guide**. This manual provides installation instructions and reference information for the SEH-22 and SEH-24.

1.1   USING THIS MANUAL

Read through this manual completely to familiarize yourself with its content and to gain an understanding of the features and capabilities of the SEH. A general working knowledge of Ethernet and IEEE 802.3 type data communications networks and their physical layer components is helpful when installing the SEH.

Chapter 1, **Introduction**, outlines the contents of this manual, briefly describes SEH features, and concludes with a list of related manuals.

Chapter 2, **Installation Requirements/Specifications**, describes installation requirements, network guidelines, and specifications.

Chapter 3, **Installation**, contains instructions for installing the SEH as a stackable or stand-alone hub.

Chapter 4, **Connecting to the Network**, explains how to connect the SEH to the network using the various media types.

Chapter 5, **Troubleshooting**, describes how to use the LANVIEW LEDs to troubleshoot network problems.

Appendix A, **EPIM Information**, provides specifications, cabling information, and switch settings for the Ethernet Port Interface Modules.

1.2 GETTING HELP

If you need additional support related to the Cabletron Systems SEH, or if you have any questions, comments, or suggestions concerning this manual, contact Cabletron Systems Technical Support:

By phone ....(603) 332-9400

                           Monday-Friday; 8am - 8pm Eastern Time

By CompuServe ....GO CTRON from any ! prompt

By Internet mail ....support@ctron.com

By FTP 134.141.197.25

    Login: *anonymous*, Password: *your email address*

1.3 SEH OVERVIEW

The SEH-22 is a non-intelligent repeating hub that has 12 RJ45 ports and one Ethernet Port Interface Module (EPIM) port on the front panel for network connections while the SEH-24 has 24 RJ45 ports and two EPIM ports on the front panel for network connections. Both models have two rear panel HubSTACK Interconnect Bus ports for stackable connections.
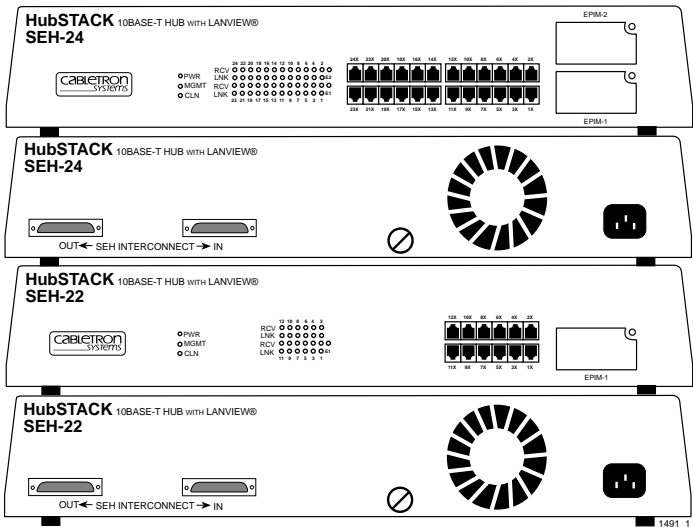

Figure 1-1. Front and Rear Views of the SEH-22 and SEH-24

Stack up to five SEH hubs using Cabletron Systems external HubSTACK Interconnect cables. Manage the stack by using the Cabletron Systems MicroMMAC or SEHI (Stackable Ethernet Hub with Intelligence). Up to four SEH hubs can be stacked with one intelligent hub. Stackable configurations make it possible to maintain only one IEEE repeater hop while providing up to 130 Ethernet ports.

1.4 SEH FEATURES

Repeater Functionality
The SEH fully conforms to the IEEE 802.3 Repeater, AUI, and 10BASE-T specifications, and provides the flexibility to connect networks using IEEE 802.3, Ethernet Version 1 or Version 2 equipment. The SEH transmits re-timed data packets, regenerates the preamble, extends fragments, and arbitrates collisions.

The SEH automatically partitions problem segments, and reconnects repaired segments to the network. This feature minimizes the impact on network operation by isolating the problem segment. Only devices on the problem segment are affected. When the problem is solved, the SEH automatically reconnects the isolated segment to the network.

Polarity Detection and Correction
Each twisted pair port on the SEH incorporates a Polarity Detection and Correction feature that allows the SEH to pass data regardless of the polarity of the twisted pair segment's receive link. Cabletron does not recommend operating in this condition. When this condition is discovered, remove the segment from the network and wire it correctly to reduce the potential for problems if equipment changes are made.

LANVIEW LEDs
Cabletron Systems LANVIEW Status Monitoring and Diagnostics System is a troubleshooting tool that helps in diagnosing power failures, collisions, cable faults, and link problems. The LANVIEW LEDs are located on the front panel.

1.5   STACKABLE CAPABILITIES

The SEH is a non-intelligent hub designed to be managed by a Cabletron Systems intelligent hub such as the SEHI or the MicroMMAC. Intelligent hubs serve as the logical "top" of the stack. They manage all SEH hubs in the stack, providing full packet and error statistics for the entire stack, individual device, or individual port. Stack up to five SEH hubs for a non-managed stack or one intelligent hub and up to four SEH hubs for a managed stack. Hubs can be added or removed from the stack without powering down the entire stack.

1.6   OPTIONAL FEATURES

The following features are not included with the SEH, but can be purchased separately from Cabletron Systems.

Ethernet Port Interface Modules (EPIMs)

EPIMs enable the expansion of a network through a variety of media. Cabletron offers the EPIMs shown in Table 1-1.

Table 1-1. EPIMs

EPIM	Media Type	Connector
EPIM-A	10BASE-5 AUI	DB15 (Female)
EPIM-C	10BASE-2 Thin Coaxial	BNC
EPIM-T	10BASE-T Unshielded Twisted Pair	RJ45
EPIM-X	Standard Transceiver	DB15 (Male)
EPIM-F1	Multimode Fiber	SMA
EPIM-F2	Multimode Fiber	ST
EPIM-F3	Single Mode Fiber	ST

Table 1-2 lists the board revision requirements for EPIMs used in the SEH-24. The board revision number is located on the EPIM's printed circuit board directly after the part number as shown in Figure 1-2.

Table 1-2. EPIM Board Revision Requirements

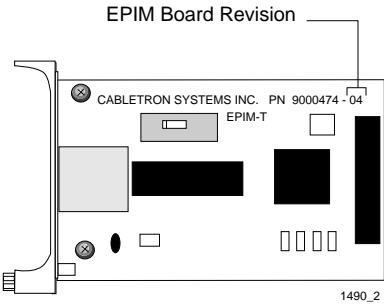| EPIM	EPIM BOARD REVISION
EPIM-A	Not Applicable
EPIM-C	05 or greater
EPIM-T	04 or greater
EPIM-X	02 or greater
EPIM-F1	05 or greater
EPIM-F2	05 or greater
EPIM-F3	02 or greater

Figure 1-2. EPIM Board Revision Number

HubSTACK Interconnect Cables

Use Cabletron HubSTACK Interconnect cables to stack hubs together.
Table 1-3 lists the part number and application for each cable.

Table 1-3. HubSTACK Interconnect Cables

P/N	Description	Application
9380110	12" HubSTACK Interconnect Cable	SEH to SEH connections.
9380111	18" HubSTACK Interconnect Cable	SEHI or MicroMMAC to SEH connections.

Rack Mount Capabilities

The SEH can be installed in a 19-inch rack. Cabletron offers an accessory
package that includes the brackets, a strain relief for cable management
and mounting screws. The part number for the accessory package is
SEH-ACCY-KIT. See Chapter 3, **Installation**, for complete rack
mounting instructions.

1.7   RELATED MANUALS

Use the following Cabletron Systems manuals to supplement the
procedures and other technical data provided in this manual. The
procedures contained in these manuals are referenced where appropriate,
rather than repeated in this manual.

SEHI-22 and SEHI-24 10BASE-T Intelligent Hub User's Guide

MicroMMAC-22E/24E and MicroMMAC-32E/34E User's Guide

CHAPTER 2

INSTALLATION
REQUIREMENTS/SPECIFICATIONS

This chapter describes network guidelines, power requirements, and operating specifications for the SEH. Be sure to read this chapter before you install the SEH. The network must meet the requirements and conditions specified in this chapter to obtain satisfactory performance from this equipment. Failure to follow these guidelines could result in poor network performance.

2.1   CABLE SPECIFICATIONS

The SEH-22 and SEH-24 network ports support Shielded Twisted Pair (STP) and Unshielded Twisted Pair (UTP) cabling.

Ethernet Port Interface Modules (EPIMs) expand a network using UTP, STP, Multimode Fiber Optic, Single Mode Fiber Optic, or Thin Coaxial cabling. For information concerning EPIMs, refer to Appendix A. The rear panel Interconnect Bus Ports support Cabletron Systems HubSTACK Interconnect cables for stackable applications.

Take care in planning and preparing the cabling and connections for the network. The quality of the connections and the length of cables are critical factors in determining the reliability of your network. The following sections describe specifications for each media type.

2.1.1   HubSTACK Interconnect Cable Requirements

Connect units in the stack with HubSTACK Interconnect cables. Refer to Chapter 1 for cable part numbers. The cables attach to the SEH rear panel bus ports.

The rear panel of the SEH has an SEH Interconnect Bus Out Port (male connector) and an SEH Interconnect Bus In Port (female connector). The bus supports five stackable devices.

2.1.2   10BASE-T UTP and STP Cable Specifications

The devices and 10BASE-T Twisted Pair Segments connected to the SEH 10BASE-T Twisted Pair Network Ports and EPIM-T module must meet the IEEE 802.3 10BASE-T specifications shown below.

Length
The IEEE 802.3 10BASE-T standard requires that 10BASE-T devices transmit over a 100 meter (328 foot) link using 22-24 AWG unshielded twisted pair wire. However, cable quality largely determines maximum link length. With high quality, low attenuation cable, link lengths of up to 200 meters are achievable. Cable delay limits maximum link length to 200 meters, regardless of cable type.

Insertion Loss
The maximum insertion loss allowed for a 10BASE-T link is 11.5 dB at all frequencies between 5 and 10 MHz. This includes the attenuation of the cables, connectors, patch panels, and reflection losses due to impedance mismatches in the link segment.

Impedance
Cabletron Systems 10BASE-T Twisted Pair products work on twisted pair cable with 75 to 165 ohms impedance. Unshielded twisted pair cables typically have an impedance of between 85 to 110 ohms.

Shielded twisted pair cables, such as IBM Type 1 cable, can also be used. The impedance of IBM Type 1 cable is typically 150 ohms. This increases the signal reflection caused by the cable, but because the cable is shielded, this signal reflection has little effect on the received signal's quality due to the lack of crosstalk between the shielded cable pairs.

Jitter
Intersymbol interference and reflections cause jitter in the bit cell timing, resulting in data errors. A 10BASE-T link must not generate more than 5.0 ns of jitter. If the cable meets the impedance requirements for a 10BASE-T link, jitter should not be a concern.

Delay

The maximum propagation delay of a 10BASE-T link segment must not exceed 1000 ns. This 1000 ns maximum delay limits the maximum link segment length to no greater than 200 meters.

Crosstalk

Crosstalk is caused by signal coupling between the different cable pairs contained within a multi-pair cable bundle. 10BASE-T transceivers are designed so that the user does not need to be concerned about cable crosstalk, provided the cable meets all other requirements.

Noise

Noise is caused by either crosstalk or externally induced impulses. Impulse noise may cause data errors if the impulses occur at very specific times during data transmission. Generally, the user need not be concerned about noise. If noise-related data errors are suspected, it may be necessary to either reroute the cable or eliminate the source of the impulse noise.

Temperature

Multi-pair PVC 24 AWG cables typically have an attenuation of 8 to 10 dB/100 meters at 20°C (68°F). The attenuation of PVC insulated cable varies significantly with temperature. At temperatures greater than 40°C (104°F), Cabletron recommends the use of plenum-rated cables to ensure that cable attenuation remains within specification.

2.2   NETWORK PORT SPECIFICATIONS

The SEH-22 and SEH-24 network ports use shielded RJ45 connectors
that support both STP and UTP cabling. Figure 2-1 shows the RJ45
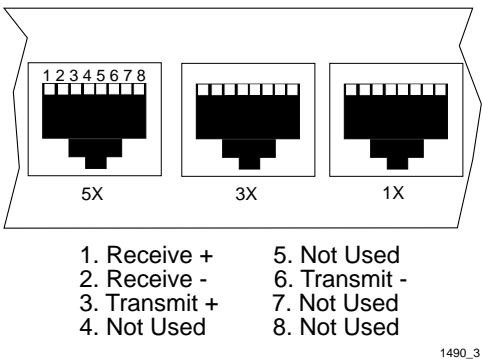pinouts.

Figure 2-1. RJ45 Network Ports

2.3   TRANSCEIVER REQUIREMENTS

When connecting an external network segment via a transceiver to the
SEH with an EPIM-A, the following requirements must be met:

- The transceiver or Ethernet Device to which the module will be
  connected must meet IEEE 802.3 standards, and/or Ethernet
  Version 1.0 or Version 2.0 standards.

- The Signal Quality Error (SQE) test function on the transceiver
  must be disabled when it is connected to a repeater or to an
  Ethernet Version 1.0 device. In addition, some Version 2.0
  equipment does not support the SQE test. Devices that do not
  support the SQE test interpret the SQE test pulse as a collision.

2.4   OPERATING SPECIFICATIONS

This section describes the operating specifications for the SEH. Cabletron Systems reserves the right to change these specifications at any time without notice.

General

Delay Times (Start of Packets):

Twisted Pair to EPIM- A	1.10 μs
Twisted Pair to Twisted Pair	1.00 μs
EPIM-A to Twisted Pair	1.00 μs

Delay Times (JAM):

Twisted Pair to EPIM-A	960 ns

Preamble:

Input:	Minimum of 40 bits required
Output:	64 bits min. (last 2 bits are 1, 1)

JAM Output:

Collisions are propagated through the network using the JAM signal of an alternating pattern of 1's and 0's in accordance with 802.3 specifications for a repeater unit.

Fragment Extension:

Packet fragments are extended to a minimum of 96 bits using the JAM [1, 0].

Fault Protection:

Each segment disconnects itself from the other segments if 32 consecutive collisions occur, or if the collision detector of a segment is on for longer than approximately 110 μs. This fault protection resets automatically after one packet is transmitted or received onto the fault protected segment without causing a collision.

Power Requirements

The SEH uses a universal power supply. The input power requirements are listed below.

Table 2-1. Power Requirements

Model	Voltage Range	Frequency Range
SEH-22/SEH-24	100-125 VAC or 200-240 VAC	50-60 Hz

The power supply has two outputs of +5 Vdc and +12 Vdc. The maximum output power is 20 W and the minimum efficiency is 65% under all conditions of line at full load.

Environmental Requirements

Operating Temperature: +5° to +50°C   (41° to 122°F)

Non-operating Temperature: -30° to +90°C   (-22° to 194°F)

Operating Humidity: 5% to 95% (non-condensing)

Safety

This unit meets the safety requirements of UL1950 (without D3 deviations), CSA C22.2 No. 950, and EN60950.

EMI

This unit meets the EMI requirements of FCC Part 15 Class A, EN55022 Class A and VCCI Class I.

EMC

This unit meets the EMC requirements of EN 50082-1 including: IEC 801-2 (ESD) levels 1 through 4, IEC 801-3 (Radiated Susceptibility) levels 1 through 4, and IEC 801-4 (EFT/B) levels 1 through 4.

WARNING *It is the responsibility of the person who sells the system to which the SEH will be a part to ensure that the total system meets allowed limits of conducted and radiated emissions.*

Physical

Dimensions (H x W x D):	2.8" x 17.0" x 8.5" (7.2 cm x 43.6 cm x 21.6 cm)
Weight:	4.9 lb (2.22 Kg)
Predicted MTBF:	SEH-22/24: 847,921 hours

CHAPTER 3

INSTALLATION

This chapter outlines the procedure for attaching the SEH to a network as either a stackable or standalone device. Ensure that the network meets the guidelines and requirements outlined in Chapter 2, **Installation Requirements/Specifications**, before installing the SEH.
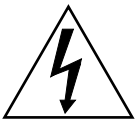
Failure to follow installation instructions may result in an electrical shock hazard.

3.1 UNPACKING THE SEH

Unpack the SEH as follows:

1. Remove the shipping material covering the SEH in the shipping box.

2. Carefully remove the SEH from the shipping box.

3. Remove the SEH from the protective plastic bag and set it aside to prevent damage.

4. Visually inspect the SEH. If there are any signs of damage, contact Cabletron Systems Technical Support immediately.

3.2 INSTALLING THE SEH

The SEH may be installed on a tabletop or shelf, or in a 19-inch rack, and configured as a standalone or stacked hub.

Refer to Section 3.2.1 for information concerning a tabletop or shelf installation. Section 3.2.2 describes the rackmount installation.

3.2.1   Tabletop or Shelf Installation

The following subsection provides guidelines for installation on a
tabletop or shelf.

Guidelines for Tabletop and Shelf Installation
Tabletop and shelf installations must be within reach of the network
cabling and meet the requirements listed below:

- A single phase 120 Vac, 15 A, grounded power receptacle must be
  located within seven feet of the location.

- In a shelf installation, the shelf must be able to support 30 pounds
  of static weight for each device in the stack.

- The temperature for the selected location must be maintained
  between 5°C (41°F) and 50°C (122°F), and fluctuate less than
  10°C per hour.

For a free-standing shelf or tabletop installation, locate the SEH within
seven feet of its power source and with an unrestricted free surface area
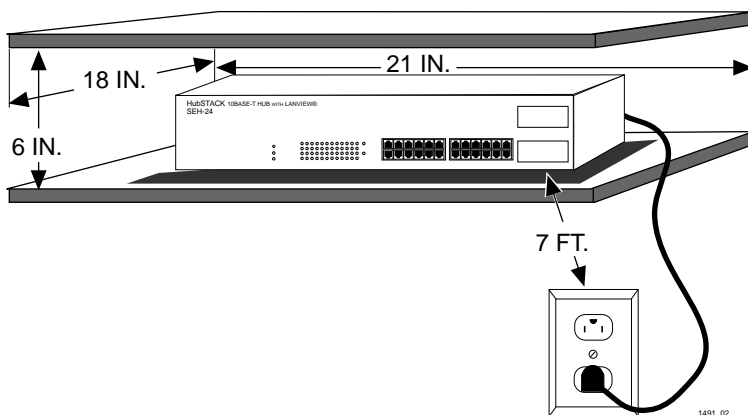21 inches wide, 18 inches deep and 6 inches high, as shown in Figure 3-1.

Figure 3-1. Shelf or Tabletop Installation

If the installation requires that the SEH be stacked, proceed to Section 3.2.5. Otherwise, continue by powering-up the SEH as described in Section 3.3.

3.2.2 Rackmount Installation Requirements

To install the SEH in a 19-inch rack, Cabletron Systems offers an accessory kit that includes rack mount brackets, mounting screws, and a strain-relief bracket for cable management. The accessory kit is not included with the SEH, but is purchased separately from Cabletron Systems as part number SEH-ACCY-KIT.

Rack mounting the SEH involves:

- Attaching the strain relief bracket
- Attaching the rackmount brackets
- Installing the SEH in a 19-inch rack
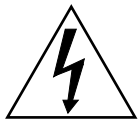- Interconnecting SEH units when applicable

Tools Required
- Phillips Screwdriver

Materials Required
The following parts are included in the SEH-ACCY-KIT accessory kit. Use Figure 3-2 to determine the correct brackets to use for this application.

- Strain relief bracket
- Left and right rackmount brackets
- 8-32 x 1/4" panhead screws (4)
- 8-32 x 3/8" panhead screws (4)

Use only the parts listed above to rack mount the SEH. The accessory kit includes other items not used in this application. Use of the wrong brackets or screws may result in damage to the unit or cause electrical shock.
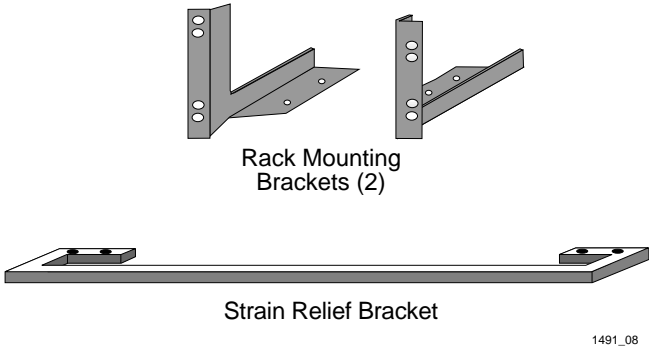
Rack Mounting
Brackets (2)

Strain Relief Bracket

1491_08

Figure 3-2. SEH Rack Mounting Hardware

3.2.3 Attaching the Strain Relief Bracket

Attach the strain relief bracket to the front of the SEH as follows:

1. Locate the strain relief bracket and four 8-32 x 3/8" screws from the accessory kit (see Figure 3-2).

Do not use screws other than those included with the SEH accessory kit. Use of longer screws may damage the unit or cause electrical shock.

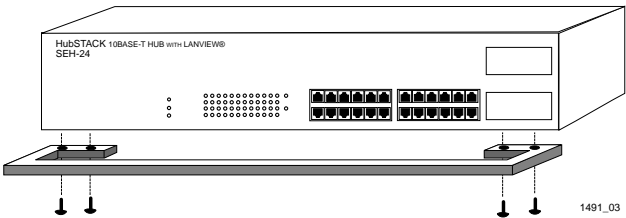2. Attach the strain relief bracket to the bottom of the SEH (Figure 3-3).

Figure 3-3. Attaching the Strain Relief

3.2.4   Rack Mounting the SEH

Refer to Figure 3-4 and perform these steps to install the SEH in a 19-inch rack.

1.   Locate the four 8-32 x 1/4" screws and the two rackmount brackets in the accessory kit (see Figure 3-2).

> *Do not use screws other than the four 8-32 x 1/4" screws included with the SEH accessory kit. Use of longer screws may damage the unit or cause electrical shock.*

2.   Using the four 8-32 x 1/4" screws provided in the accessory kit, attach the rack mounting brackets to the bottom of the SEH as shown in Figure 3-4.
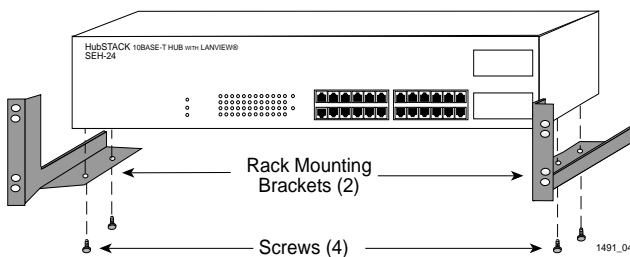

Figure 3-4.   Installing the Rack Mount Brackets

3.   With the mounting brackets installed, position the SEH between the vertical frame members of the 19-inch rack and fasten it securely with mounting screws as shown in Figure 3-5.
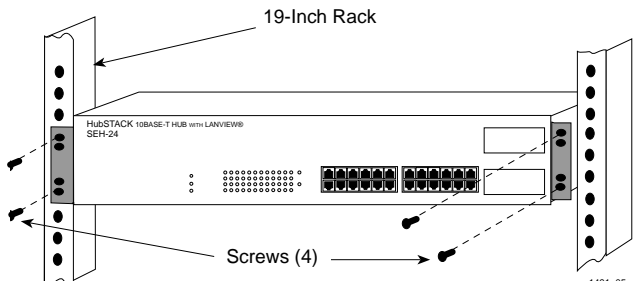
Figure 3-5. Installing the SEH in the Rack

If the installation requires that the SEH is to be stacked, proceed to Section 3.2.5. Otherwise, continue by connecting power as described in Section 3.3.

3.2.5   Stacking the SEH

The rear panel of the SEH has an SEH Interconnect Bus In Port (female connector) and an SEH Interconnect Bus Out Port (male connector). Daisy chain units together using Cabletron Systems HubSTACK Interconnect cables. Table 3-1 describes each cable.

Table 3-1. HubSTACK Interconnect Cables

P/N	Description	Application
9380110	12" HubSTACK Interconnect Cable	SEH to SEH connections.
9380111	18" HubSTACK Interconnect Cable	SEHI or MicroMMAC to SEH connections.

To stack SEHs, refer to Figure 3-6 and perform the following steps:

1. Attach one end of the SEH HubSTACK Interconnect cable to the bus port labeled "OUT" on the rear panel of the SEH.

2. Attach the other end of the SEH HubSTACK Interconnect cable to the bus port labeled "IN" on the rear panel of the SEH next in the stack.

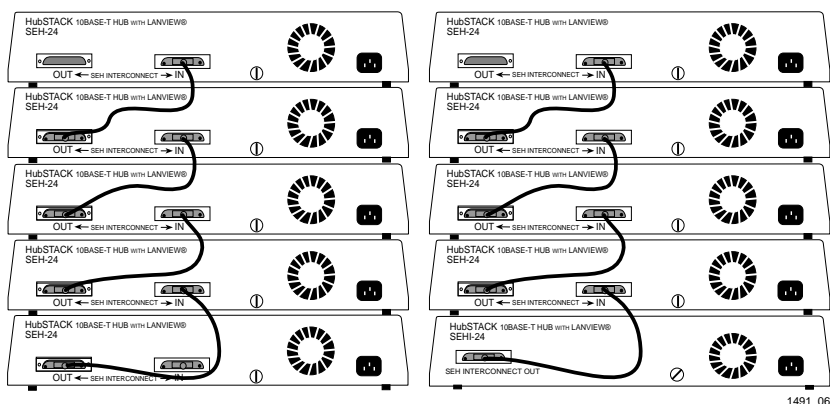3. Attach up to four SEH hubs in the stack repeating steps 1 and 2.

Figure 3-6. Stacking the SEH

To attach an SEH to an SEHI, refer to Figure 3-6 and follow these steps:

1. Attach the SEHI HubSTACK Interconnect cable to the bus port labeled "OUT" on the rear panel of the SEHI.

2. Attach the other end of SEHI HubSTACK Interconnect cable to the bus port labeled "IN" on the rear panel of the SEH next in the stack.

If one end of a HubSTACK Interconnect cable is disconnected without disconnecting the other end attached to the hub, ensure that you disconnect the cable from the "OUT" port as shown in Figure 3-7. This ensures that the HubSTACK Interconnect cable is terminated properly.
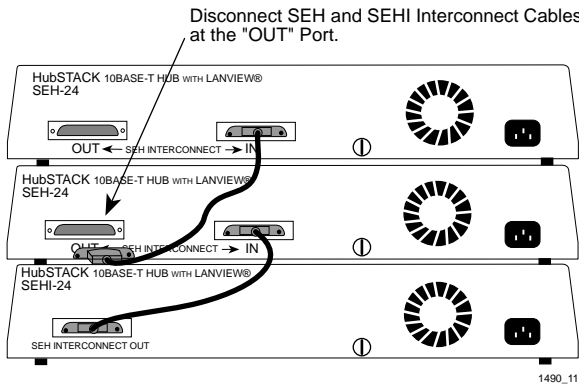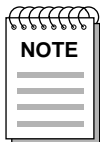

Figure 3-7. Disconnecting the HubSTACK Interconnect Cable

Proceed to Section 3.3 to connect power.

3.3   CONNECTING THE SEH TO THE POWER SOURCE

NOTE	*The SEH uses a universal power supply that operates between 100-125 VAC or 200-240 VAC at 50-60 Hz.*

Connect the SEH to the power source as follows:

1.   Plug the power cord into the back panel of the SEH.

2.   Plug the other end of the power cord into a grounded wall outlet.

3.   Verify that the **PWR** LED is on; this indicates that the SEH is receiving power.
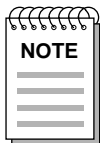
3.4   ADDING/REPLACING EPIMs

This section contains procedures on how to add or replace an Ethernet Port Interface Module (EPIM) to upgrade or change the capabilities of your SEH. After installing a new EPIM, refer to the appropriate EPIM section in Appendix A to verify proper operation.

CAUTION	*Observe all static precautions while handling EPIMs.*

To install an EPIM:

NOTE	*When removing an EPIM, pull the module straight out to prevent damage to the connector.*

1.   Remove the coverplate or the EPIM (whichever applies).

2. Slide the new EPIM into place, making sure that the connectors on the rear of the EPIM align correctly and firmly with the connector inside the SEH. Refer to Figure 3-8.
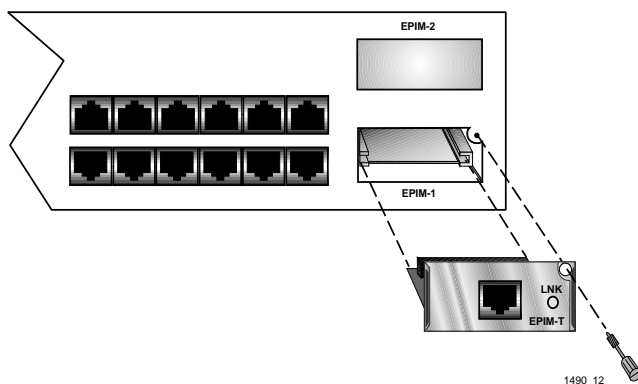
3. Install the mounting screw.

Figure 3-8. Installing an EPIM

CHAPTER 4

CONNECTING TO THE NETWORK

This chapter outlines the procedure for connecting the SEH to a network. Ensure that the network meets the guidelines and requirements outlined in Chapter 2, **Installation Requirements/Specifications**, before installing the SEH.

4.1   CONNECTING THE SEH TO THE NETWORK

The procedure for connecting network segments to the SEH varies depending on the media and ports being connected. Refer to the following list and perform the procedure described in the subsections that apply to your SEH:

- Network Ports SEH-22 and SEH-24   4.1.1
- Connecting EPIMs to the Network   4.1.2 - 4.1.6

Prior to connecting the network cabling check the connectors for the proper pinouts as shown in Chapter 2.

4.1.1   Connecting Network Ports, SEH-22 and SEH-24

Attach unshielded twisted pair segments to the RJ45 Network Ports on the front panel of the SEH. Each twisted pair port on the SEH incorporates a Polarity Detection and Correction feature. The Polarity Detection and Correction feature allows the SEH to pass data regardless of the polarity of the twisted pair segment's receive link. Operating in this condition is not recommended, the segment should be removed from the network and wired correctly by a technician.

Connect twisted pair segments to the SEH as follows:

1. Insert the RJ45 connector from each twisted pair segment into the desired network port on the SEH. See Figure 4-1.
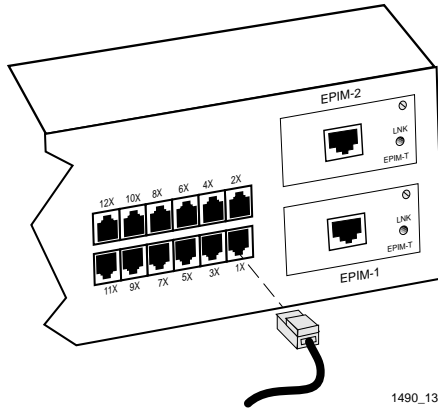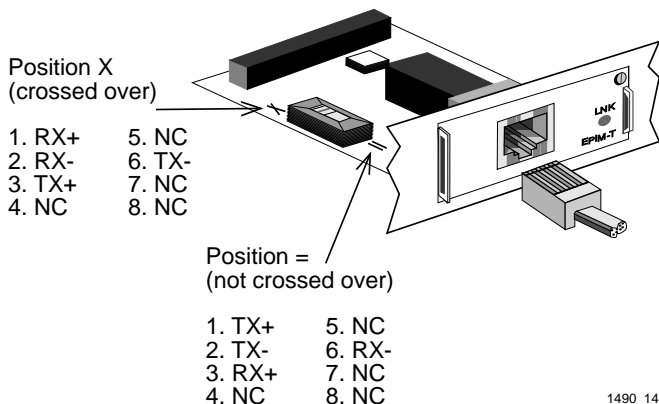

Figure 4-1. SEH-24 Network Ports

2. Check that the applicable **LNK** LED for the port is on. If the LED is off, perform each of the following steps until it is on:

    a. Check that the 10BASE-T device at the other end of the twisted pair segment is powered up.

    b. Verify that the RJ45 connector on the twisted pair segment has the proper pinouts. Check the cable for continuity.

    c. Check that the twisted pair connection meets dB loss and cable specifications outlined Chapter 2.

If a link is not established, contact Cabletron Systems Technical Support.

4.1.2   Connecting a UTP Segment to an EPIM-T

Before connecting a segment to the EPIM-T, check each end of the segment to determine if the wires are crossed over for the proper connection. If the wires do not cross over, use the switch on the EPIM-T to internally cross over the RJ45 port. Refer to Figure 4-2 to properly set the EPIM-T crossover switch.

Position X
(crossed over)

1. RX+	5. NC
2. RX-	6. TX-
3. TX+	7. NC
4. NC	8. NC

Position =
(not crossed over)

1. TX+	5. NC
2. TX-	6. RX-
3. RX+	7. NC
4. NC	8. NC

1490_14

Figure 4-2. EPIM-T Crossover Switch

Connect an EPIM-T to a Twisted Pair Segment as follows:

1.   Insert the RJ45 connector on the twisted pair segment into the RJ45 port on the EPIM. See Figure 4-2.

2.   Check that the EPIM **LNK** LED is on. If the LED is off, perform each of the following steps until it is on:

   a.   Check that the 10BASE-T device at the other end of the twisted pair segment is powered up.

   b.   Verify the RJ45 connector's pinouts.

    c.   Check the cable for continuity.

    d.   Check that the twisted pair connection meets dB loss and cable specifications outlined in Chapter 2.

    e.   Check that the crossover switch is in the correct position.

If a link is not established, contact Cabletron Systems Technical Support.

4.1.3   Connecting a Fiber Segment to an EPIM-F1/F2/F3

When connecting a fiber optic link segment to an EPIM-F1, EPIM-F2, or EPIM-F3 keep the following in mind:

- When connecting a fiber optic link segment with SMA 906 connectors to an EPIM-F1 with SMA ports, ensure that half alignment sleeves are in place on each connector. A full alignment sleeve will damage the receive port. SMA 905 connectors do not need alignment sleeves.

- To connect a segment with ST connectors to an EPIM-F2 /F3, keep in mind that ST connectors attach to ST ports much like BNC connectors attach to BNC ports. Insert the connector into the port with the alignment key on the connector inserted into the alignment slot on the port. Turn the connector to lock it down.

- The physical communication link consists of two strands of fiber optic cabling: the Transmit (TX) and the Receive (RX). The Transmit strand from the applicable port on the module is connected to the Receive port of a fiber optic Ethernet device at the other end of the segment. The Receive strand of the applicable port on the module is connected to the Transmit port of the fiber optic Ethernet device.

- Label the fiber optic cable to indicate which fiber is Receive and which is Transmit. Fiber optic cable purchased from Cabletron Systems is labeled so that one fiber is labeled 1 and the other fiber is labeled 2 at both ends of the cable. For cable not purchased from Cabletron Systems, label the cable as described above.

Caution: Do not touch the ends of the fiber optic strands, and do not let the ends come in contact with dust, dirt, or other contaminants. Contamination of the ends causes problems in data transmissions. If the ends become contaminated, clean them with alcohol using a soft, clean, lint free cloth.

Connect a segment to an EPIM-F1, EPIM-F2, or EPIM-F3 as follows:

1. Remove the plastic covers from the fiber optic ports on the applicable port on the module and from the ends of the connectors on each fiber strand.

2. Attach the fiber labeled 1 to the applicable receive port, labeled **RX**, on the module. See Figure 4-3.

3. Attach the fiber labeled 2 to the applicable port labeled **TX**, on the module.

4. At the other end of the fiber optic cable, attach the fiber labeled 1 to the transmit port of the device.

5. Attach the fiber labeled 2 to the receive port.

6. Check that the EPIM **LNK** LED is on. If the LED is off, perform the following steps until it is on:

    a. Check that the power is on for the device at the other end of the link.

    b. Verify proper "crossover" of fiber strands between the applicable port on the module and the fiber optic device at the other end of the fiber optic link segment.

    c. Verify that the fiber connection meets the dB loss specifications outlined in Chapter 2.

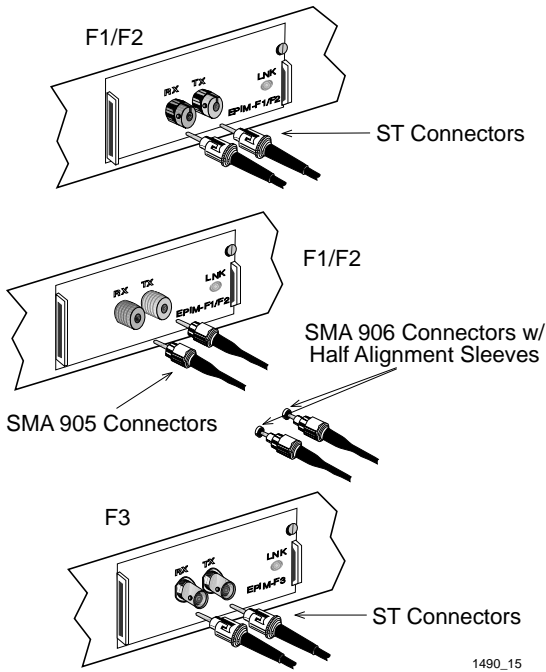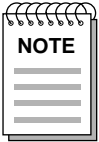If a link is not established, contact Cabletron Systems Technical Support.

Figure 4-3. The EPIM-F1, EPIM-F2 and EPIM-F3

4.1.4 Connecting a Thin-Net Segment to an EPIM-C

To connect a thin-net segment to an EPIM-C, refer to Figure 4-4 and perform the following steps:

1. Set the Internal Termination Switch labeled **TERM** to:

    •   The ON position ($\bullet$) if the thin-net segment connected directly to the port will be internally terminated at the port.

    •   The OFF position (o) if the thin-net segment will not be terminated at the port or externally terminated.

2. If the Internal Termination switch is in the ON position, connect the thin-net segment directly to the BNC port as shown in Figure 4-4.

3. If the Internal Termination switch is in the OFF position:

   a. Attach a BNC tee-connector to the BNC port on the module.

   b. Attach the thin-net segment to one of the female connectors on the tee-connector.

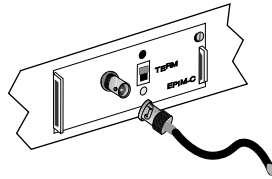| NOTE	*Terminate each segment attached to the tee-connector. If a segment is not attached to one of the female connections on the tee-connector, place a terminator on that connection.*

   c. Attach another thin-coax segment or a terminator to the other female connector on the tee-connector.

Figure 4-4. The EPIM-C

4.1.5   Connecting an AUI Cable to an EPIM-A

> ⚠️ **CAUTION**
>
> *Ensure that the Signal Quality Error (SQE or "heartbeat")
> test function is disabled on the external transceiver connected
> to the SEH. The SEH will not operate and the network will be
> unusable if the transceiver has the SQE test function enabled.
> Refer to the applicable transceiver manual.*

Connect an EPIM-A to an external network segment as follows:

1.   Attach an external transceiver to the network segment that will be
     connected to the AUI port. Refer to the applicable transceiver manual.

2.   Attach an AUI cable, no longer than 50 meters in length, to the
     transceiver connected to the network in step 1.

3.   Connect the AUI cable to the EPIM-A. (See Figure 4-5.)

4.   Lock the AUI connector into place using the connector slide latch.
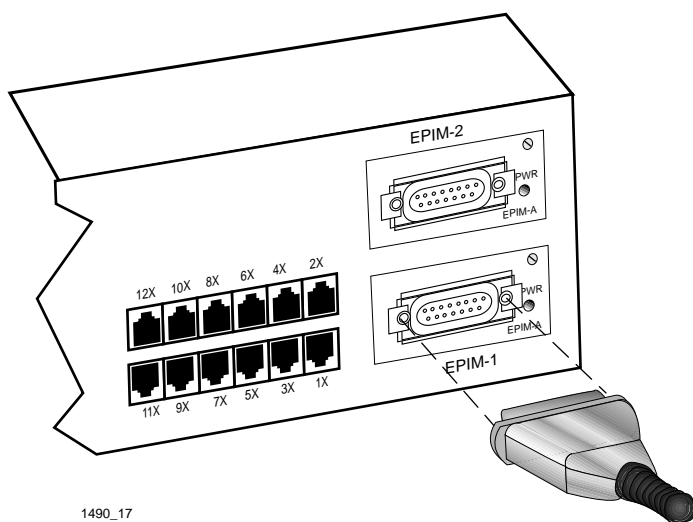

1490_17

Figure 4-5. The EPIM-A

5. Check that the **PWR** LED on the EPIM-A is on. If the LED is off, contact Cabletron Systems Technical Support.

6. If the **PWR** LED is on with the AUI cable disconnected, continue with the following checks:

   a. Check the AUI connections for proper pinouts. The pinouts for the transceiver connection are listed in Chapter 2.

   b. Check the cable for continuity.

   c. Reconnect the AUI cable to the SEH and the device.

If the LED is still not on after reconnecting the segment, contact Cabletron Systems Technical Support.

4.1.6 Connecting an AUI Cable to an EPIM-X

The Signal Quality Error (SQE) switch remains in the OFF position for most network connections. However, some Data Terminal Equipment (DTE) requires SQE. Refer to your DTE manual for SQE requirement information.

To connect an EPIM-X to a device not requiring SQE:

1. Check that the **SQE** LED on the EPIM-X is off. If the **SQE** LED is on, check the position of the SQE switch.
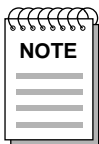
If the SQE light remains on, even though the SQE switch is in the OFF position, contact Cabletron Technical Support.

2. Attach one end of an AUI cable, no longer than 50 meters in length, to the port on the EPIM-X (Figure 4-6) and the other end to the intended node.
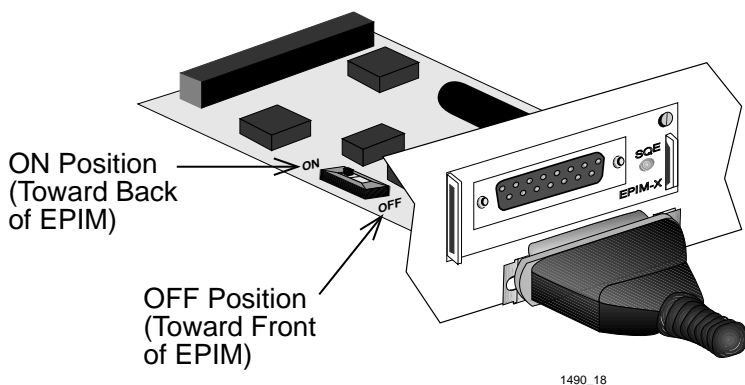
Figure 4-6. The EPIM-X

4.2 FINISHING THE INSTALLATION

The SEH is now ready for operation. Before placing the network into service, test the installation thoroughly, making sure that all stations can be addressed and that the SEH and all stations are indicating normal operation. Ensure that the networking software is configured properly to match the installed network. If errors or abnormal operation are encountered, proceed to Chapter 5, **Troubleshooting**.

CHAPTER 5

TROUBLESHOOTING

This chapter contains instructions for using LANVIEW LEDs to troubleshoot physical layer network problems.

5.1 INSTALLATION CHECK-OUT

After connecting the SEH to the network, verify that packets pass between all Ethernet devices connected to the SEH and any other devices connected to the network. If difficulty is encountered with any of the attached devices, check the link as follows:

1. Check that the **LNK** LED, if applicable, for the port is on. If the LED is off, try the following steps.

   a. Check that the 10BASE-T device at the other end of the twisted pair segment is powered up.

   b. Verify that the connector on the twisted pair segment has the proper pinouts. Refer to Chapter 2 for the pin assignments for twisted pair connectors.

   c. For EPIM-F1/EPIM-F2/EPIM-F3 check that the TX and RX fibers are properly connected.

   d. Check the cable for continuity. A variety of tools are available for this test, depending on the media you are using.

   e. Check that the twisted pair segments meet cable specifications for dB loss described in Chapter 2.

2. If the remote station is ready and the **LNK** LED is on, but no data passes through the port, one of two conditions may exist:

    *   Network management has disabled the port.

    *   The port is segmented either because the collision detector was on for more than 110 µs or the SEH detected more than 32 consecutive collisions on the attached segment. The affected port remains segmented until a good packet is transmitted/received without collisions.
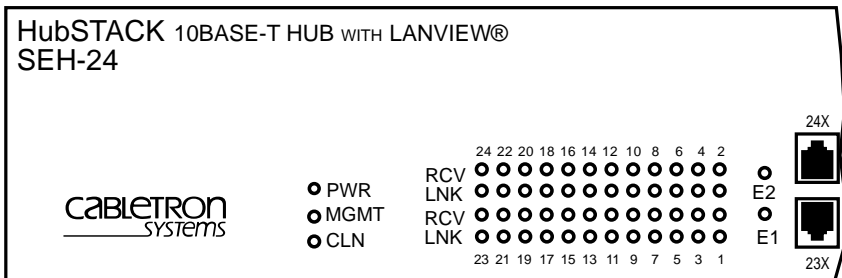
If the **LNK** LED is still not on, contact Cabletron Systems Technical Support.

5.2   USING LANVIEW

The SEH incorporates the Cabletron Systems LANVIEW Status Monitoring and Diagnostics System. LANVIEW LEDs help diagnose problems such as a power failure or a cable fault. The SEH includes the following LANVIEW LEDs:

*   **PWR**, for power status

*   **MGMT**, for management status

*   **RCV** (Receive), **LNK** (Link), and **CLN** (Collision) for Ethernet status.

Figure 5-1 provides a quick reference chart of LED locations and definitions. This chapter also includes a detailed description of each LED.

HubSTACK 10BASE-T HUB WITH LANVIEW®
SEH-24

CABLETRON SYSTEMS

○ PWR
○ MGMT
○ CLN

24 22 20 18 16 14 12 10 8 6 4 2
RCV ○○○○○○○○○○○○
LNK ○○○○○○○○○○○○
RCV ○○○○○○○○○○○○
LNK ○○○○○○○○○○○○
23 21 19 17 15 13 11 9 7 5 3 1

24X

○ E2
○ E1

23X

LED Name	LED Color	Definition
PWR (Power)	Off	No power
	Green (Solid)	Power
MGMT (Management)	Green (Flashing)	SEH managed by an intelligent hub
	Off	SEH not managed
CLN (Collision)	Red	Collision
RCV (Receive)	Yellow (Flashing)	SEH is receiving data
	Off	No activity
LNK (Link)	Green	Link established
	Off	No link

1491_07

Figure 5-1. LANVIEW LEDs

PWR (Green)
When this LED is on, the SEH is receiving power. If this LED is off, it indicates a loss of input power. Check the power source (circuit breaker, fuse, etc.). If the proper source power is present, the problem could be with the SEH.

MGMT (Green Flashing)
This LED flashes when an intelligent hub manages the SEH. If this LED does not flash, an intelligent hub is not managing the SEH. If an intelligent hub is connected to the SEH and the LED does not flash, inspect the HubSTACK Interconnect cables for proper connections.

CLN (Red)
This LED indicates that a collision has occurred on one of the ports.

RCV (Yellow Flashing)
When this LED flashes, it indicates that the SEH is receiving data packets from the associated port segment. Each SEH port has a corresponding RCV LED:

- Network Ports: RCV LEDs **1-24**

- EPIM-1: RCV LED **E1**

- EPIM-2: RCV LED **E2**

LNK (Green)
When a LNK LED is on, it indicates an established link between the associated port segment and the device at the other end of the segment. LNK LEDs remain on as long as a link is maintained. Each SEH Network Port (ports 1-22 on the SEH-22 and ports 1-24 on the SEH-24) has a corresponding LNK LED.
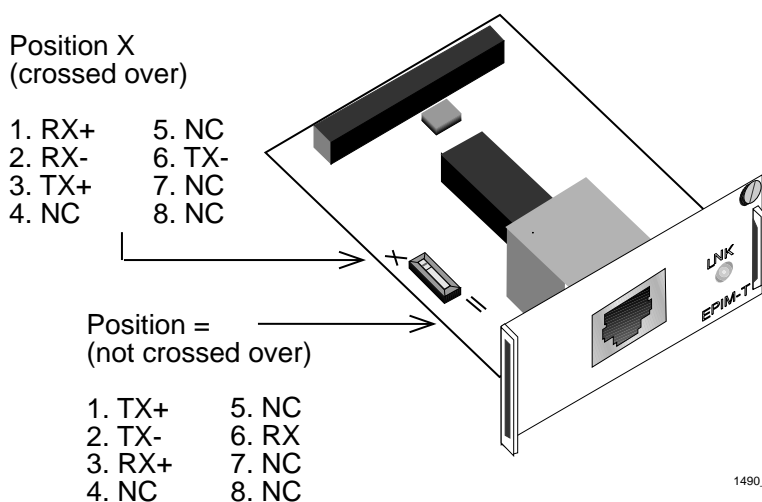
APPENDIX   A

EPIM INFORMATION

A.1   EPIM SPECIFICATIONS

EPIMs enable the connection of the SEH to the main network using different media types. Cabletron Systems offers a variety of EPIMs. The following sections explain specifications for each EPIM.

A.1.1   EPIM-T

The EPIM-T is an RJ45 connector supporting UTP cabling. It has an internal Cabletron Systems TPT-T 10BASE-T Twisted Pair Transceiver.

The slide switch on the EPIM-T determines the cross-over status of the cable pairs. If the switch is on the **X** side, the pairs are internally crossed over. If the switch is on the = side, the pairs are not internally crossed over. Figure A-1 shows the pinouts for the EPIM-T in both positions.

Position X
(crossed over)

1. RX+   5. NC
2. RX-   6. TX-
3. TX+   7. NC
4. NC   8. NC

Position =
(not crossed over)

1. TX+   5. NC
2. TX-   6. RX
3. RX+   7. NC
4. NC   8. NC

1490_29

Figure A-1. EPIM-T Pinouts

A.1.2   EPIM-F1 and EPIM-F2

The EPIM-F1 and EPIM-F2 shown in Figure A-2 support Multimode Fiber Optic cabling. Each EPIM has an internal Cabletron Systems FOT-F Fiber Optic Transceiver. The EPIM-F1 is equipped with SMA Connectors and the EPIM-F2 is equipped with ST Connectors. Specifications for the EPIMs are listed below.
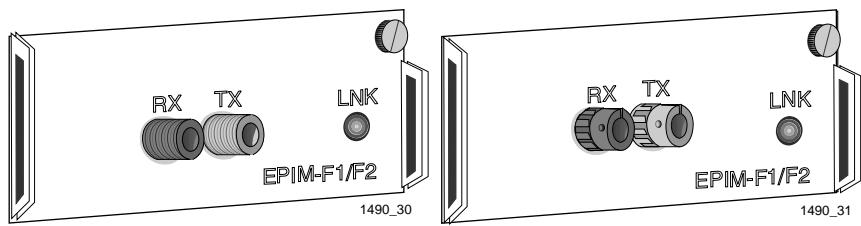

Figure A-2. EPIM-F1 and EPIM-F2

Parameter	Typical Value	Worst Case	Worst Case Budget	Typical Budget
Receive Sensitivity	-30.5 dBm	-28.0 dBm	—	—
Peak Input Power	-7.6 dBm	-8.2 dBm	—	—
Transmitter Power				
50/125 µm fiber	-13.0 dBm	-15.0 dBm	13.0 dB	17.5 dB
62.5/125 µm fiber	-10.0 dBm	-12.0 dBm	16.0 dB	20.5 dB
100/140 µm fiber	-7.0 dBm	-9.0 dBm	19.0 dB	23.5 dB
Error Rate	Better than 10^{-10}			

Note: The transmitter power levels and receive sensitivity levels listed are Peak Power Levels after optical overshoot. Use a Peak Power Meter compare the values given above to those measured on any particular port. If Power Levels are being measured with an Average Power Meter, add 3 dBm to the measurement to compare the measured values to the values listed (i.e., -33.5 dBm average + 3 dBm =-30.5 dBm peak).

A.1.3   EPIM-F3

The EPIM-F3 shown in Figure A-3 supports Single Mode Fiber Optic cabling. It has an internal Cabletron Systems FOT-F Fiber Optic Transceiver and is equipped with ST Connectors. Specifications for the EPIM-F3 are listed on the following page.
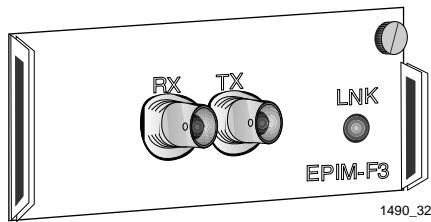

1490_32

Figure A-3. EPIM-F3

Note: Transmitter Power decreases as temperatures rise and increases as temperatures fall. Use the Output Power Coefficient to calculate increased or decreased power output for your operating environment. For example, the typical power output at 25°C is -16.4 dBm. For a 4°C temperature increase, multiply the typical coefficient (-0.15 dBm) by four and add the result to typical output power (4 x -0.15 dBm + -16.4 = -17.0).
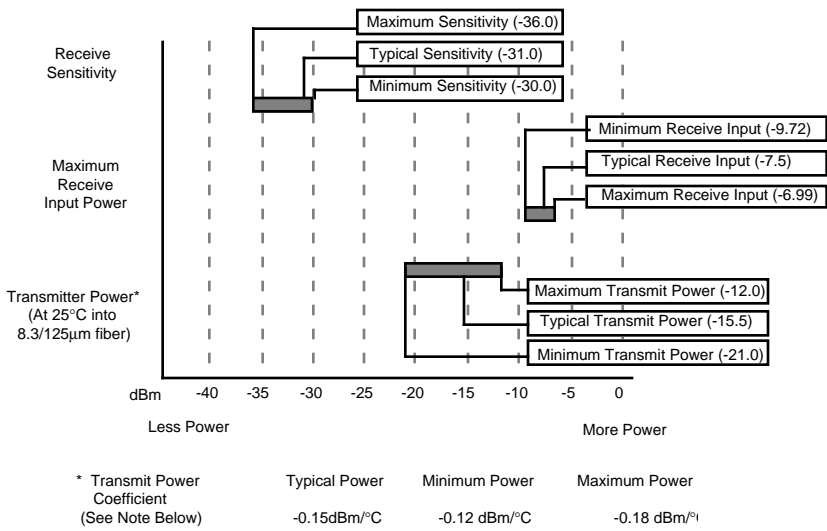
| Parameter	Typical	Minimum	Maximum
Transmitter Peak Wave Length	1300 nm	1270 nm	1330 nm
Spectral Width	60 nm	-	100 nm
Rise Time	3.0 ns	2.7 ns	5.0 ns
Fall Time	2.5 ns	2.2 ns	5.0 ns
Duty Cycle	50.1%	49.6%	50.7%
Bit Error Rate:	Better than 10^{-10}		

Note: The transmitter power levels given above are Peak Power Levels after optical overshoot. You must use a Peak Power Meter to correctly compare the values given above to those measured on any particular port. If you are measuring power levels with an Average Power Meter, add 3 dBm to the average power measurement to correctly compare the average power values measured to the values listed above (i.e., -33.5 dBm average + 3 dBm = -30.5 dBm peak).

A.1.4   EPIM-C

The EPIM-C supports thin-net coaxial cabling and is equipped with an internal Cabletron Systems TMS-3 Transceiver. Use the TERM switch on the front of the EPIM-C to set the internal 50 ohm terminator. This eliminates the need to connect the port to a tee-connector and terminator. Figure A-4 shows the settings for the terminator switch.

Internal Termination Switch
● = On (internally terminated)
○ = Off (need external termination)
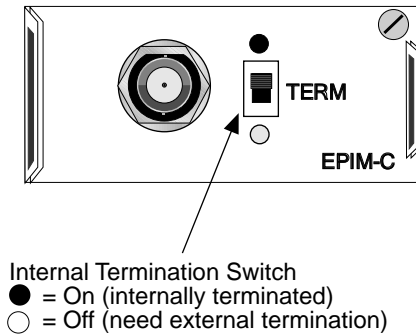
1490_34

Figure A-4. EPIM-C

Connector Type

BNC receptacle, with gold center contact, for use with BNC type tee-connectors and RG-58 thin-net cable.

Grounding

For safety, only one end of a thin-net segment should be connected to earth ground. Connection to earth ground at more than one point on the segment may cause dangerous ground currents.

The BNC port of the Coaxial Interface Module is not internally connected to earth ground.

A.1.5 EPIM-A and EPIM-X (AUI Port)

The EPIM-A is a DB15 female connector used to attach segments to an external transceiver. The EPIM-X is equipped with dual internal transceivers. It has a DB15 male connector used to attach segments to an AUI cable. Figure A-5 shows both modules.
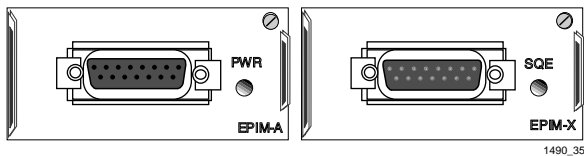

Figure A-5. The EPIM-A and EPIM-X

DB15 Pinouts

Pin	1	Logic Ref.		9	Collision -
	2	Collision +		10	Transmit -
	3	Transmit +		11	Logic Ref.
	4	Logic Ref.		12	Receive -
	5	Receive +		13	Power (+12Vdc)
	6	Power Return		14	Logic Ref.
	7	No Connection		15	No Connection
	8	Logic Ref.			

Connector Shell: Protective Ground

A.2   EPIM CABLE SPECIFICATIONS

The following subsections provide cable specifications for the various
EPIMs use in the SEH.

A.2.1   Multimode Fiber Optic Cable Specifications

Table A-1 shows Multimode Fiber Optic Cable specifications for the
EPIM-F1 and EPIM-F2 modules.

Table A-1. Multimode Fiber Optic Cable Specifications

Cable Type	Attenuation	Maximum Cable Length
50/125 µm	13.0 dB or less	The maximum allowable fiber optic cable length is 2 km (2187.2 yds). However, IEEE 802.3 specifications allow for a maximum of 1 km (1093.6 yds).
62.5/125 µm	16.0 dB or less	
100/140 µm	19.0 dB or less	

Attenuation
Test the fiber optic cable with a fiber optic attenuation test set adjusted for
an 850 nm wavelength. This test verifies that the signal loss in a cable is
within an acceptable level. Table A-1 shows the attenuation for each
Multimode cable type.

Fiber Optic Budget and Propagation Delay
When determining the maximum fiber optic cable length, take into
consideration the fiber optic budget delay and total network propagation
before fiber optic cable runs are incorporated in any network design.

Fiber optic budget is the combination of the optical loss due to the fiber
optic cable, in-line splices, and fiber optic connectors.

Propagation delay is the amount of time it takes data to travel from the
sending device to the receiving device. Total propagation delay allowed
for the entire network must not exceed 25.6 µs in one direction (51.2 µs
round trip). If the total propagation delay between any two nodes on the
network exceeds 25.6 µs, use bridges.

A.2.2   Single Mode Fiber Optic Cable Specifications

Table A-2 shows Single Mode Fiber Optic Cable specifications for the EPIM-F3.

Table A-2. Single Mode Fiber Optic Cable Specifications

Cable Type	Attenuation	Maximum Cable Length
8/125-12/125 µm	10.0 dB or less	The maximum allowable fiber optic cable length is 5 km (3.1 miles) with bridges at each segment end. However, IEEE 802.3 FOIRL specifications specify a maximum of 1 km (1093.6 yds).

Attenuation
Test the fiber optic cable with a fiber optic attenuation test set adjusted for an 1300 nm wavelength. This test verifies that the signal loss in a cable is 10.0 dB or less for any given single mode fiber optic link.

Fiber Optic Budget and Propagation Delay
Fiber optic budget is the combination of the optical loss due to the fiber optic cable, in-line splices, and fiber optic connectors. When determining the maximum fiber optic cable length, the fiber optic budget (total loss of 10.0 dB or less between stations) and total network propagation delay must be considered before fiber optic cable runs are incorporated in any network design.

Propagation delay is the amount of time it takes data to travel from the sending device to the receiving device. Total propagation delay allowed for the entire network must not exceed 25.6 µs in one direction (51.2 µs round trip). If the total propagation delay between any two nodes on the network exceeds 25.6 µs, use bridges.

A.2.3   Thin-Net Network Requirements for the EPIM-C

When you connect a thin-net segment to the SEH (via an EPIM-C), your network must meet the following requirements:

Cable Type
Use 50 ohm RG-58A/U coaxial cable to make up a thin-net segment.

Length
The thin-net segment must be no longer than 185 meters.

Terminators
 Connect a 50 ohm terminator to the far end of each thin-net segment.

Connectors
A maximum of 29 tee-connectors may be used throughout the length of cable segment for host connections. If an excessive number of barrel connectors are used within the cable segment, such as finished wall plates with BNC feed-throughs, a reduced number of host connections may be required. For special network design, contact Cabletron Systems Technical Support.

Grounding
For safety, ground only **one** end of a thin-net segment. Do NOT connect EPIM BNC ports to earth ground.
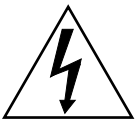
For safety, only one end of a thin-net segment should be connected to earth ground. Connection to earth ground at more than one point on the segment may cause dangerous ground currents.

A.2.4   AUI Cable Requirements for the EPIM-A and EPIM-X

To connect an external network segment to the SEH (via an EPIM-A or EPIM-X), the AUI cable must meet the following requirements:

AUI Cable
The cable between the module and device must be IEEE 802.3 type cable.

Length
The AUI Cable must not exceed 50 meters in length. If 28 AWG thin office drop cable is used, the maximum length is 15.24 meters (50 feet).

Grounding
The connector shells of the EPIM-A and EPIM-X connect to ground.

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POWER SUPPLY CORD

The mains cord used with this equipment must be a 2 conductor plus ground type with minimum 0.75 mm square conductors and must incorporate a standard IEC appliance coupler on one end and a mains plug on the other end which is suitable for the use and application of the product and that is approved for use in the country of application.

GERMAN:

Die Netzleitung, die mit diesem Geraet benuetzt wird, soll einen zwei Leiter mit Erdleiter haben, wobei die Leiter mindestens 0.75 mm sind, mit einer normalen IEC Geraetesteckdose an einem Ende und einem Geraetestecker am anderen Ende versehen sind, der fuer den Gebrauch und die Anwendung des Geraetes geeignet und der zum Benuetzen im Lande der Anwendung anerkannt ist.

SPANISH:

El cable principal de la red eléctrica utilizado con este equipo debe tener 2 conductores y 1 toma de tierra con un mínimo de 0.75 mm2 cada uno y necesita tener un aparato de acoplamiento standard IEC en un extremo y un enchufe para el cable principal de la red eléctrica en el otro extremo, lo cual sea adecuado para el uso y
applicación del producto y lo cual sea aprobado para uso en el pais de application.

FRENCH:

Le cordon d' alimentation reliant cet appareil au secteur doit obligatoirement avoir deux fils conducteurs de 0.75 mm2 minimum et un fil de terre. It doit également être équipé du côté appareil d'une fiche agrée IEC et du côte secteur, d'une prise adaptée à l'usage du produit et aux normes du pays où l'appareil est utilisé.